Combined Heat and Power Roadmap Workshop

September 20-21, 2004

Austin Texas

Long Term Economic Advantage

With C.H.P.

For Health Care Facilities

Boilers, Chillers, Engine Generators, Cooling Towers

Not Exciting Terms to Medical Personnel

When Equipment Replacement,

Systems Upgrades or Facility Expansion are needed

Funding may not be readily available

Savings through the efficient Energy cycle of C.H.P. systems

Can offset capital cost without adding cost to patient care

Consider 2 Examples of Hospitals with C.H.P.

(1)

Facility One:

A 563 bed Chicago Area Hospital

Undergoes a $ 120 million expansion.

Problem: Existing Mechanical Systems

(i.e. Boilers, Chillers, and Piping)

Are over burdened, undersized, environmentally unfriendly, incompatible steam systems, chilled water hydronic flow problems.

No room for expansion of Boiler and Equipment rooms.

Recommended Solution

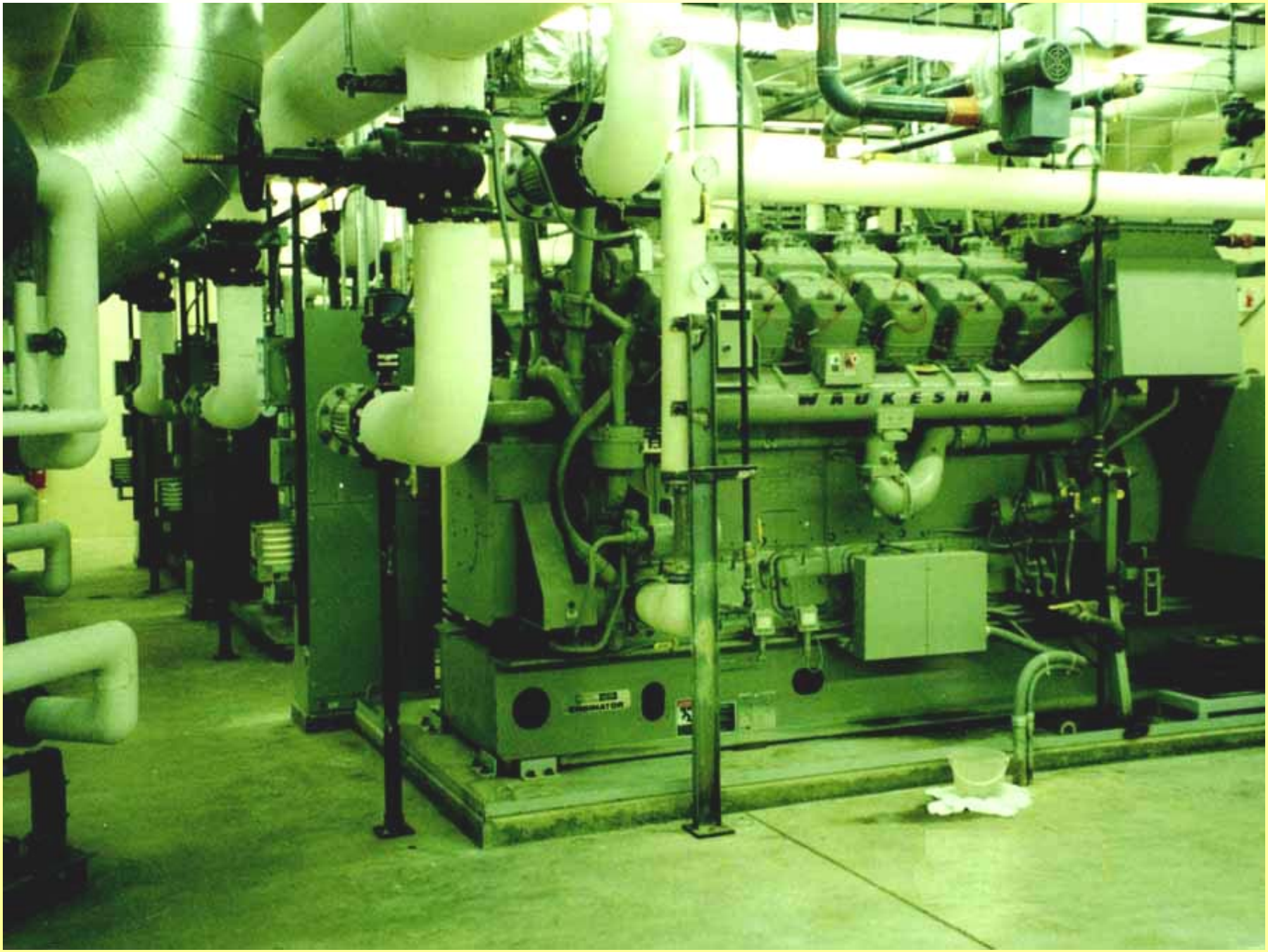
(A) Retire Old Boilers, and Chillers Replace with New

(B) Balance Chilled water headers with with Differential Pressure Control

(C) Install 125 Psig Steam Header and Tie direct to Existing high pressure header and low pressure header thru PRV's

(D) Install a 3.45 Mw C.H.P. system

(E) Build a New Central Energy Plant to house all new equipment.


WAUKESHA

Total Cost $ 12 million

For

Maintenance, Grounds, Central Energy Plant Facility

Break Down

$ 8 million in NEW Equipment and installation (Including C.H.P.)

$ 2.5 million Building

$ 1.5 million in Grounds, Maintenance, and

Chemical / Medical gas systems

Financed through Low Cost state financing

Economic Benefits

C.H.P. Positive Cash flow Offsets Capital costs for Major Equipment and installation of new Energy plant in 12 years

No Additional cost to Patient Care

Additional Benefits

Health Care Facility has 100 % Back-up Electrical Power

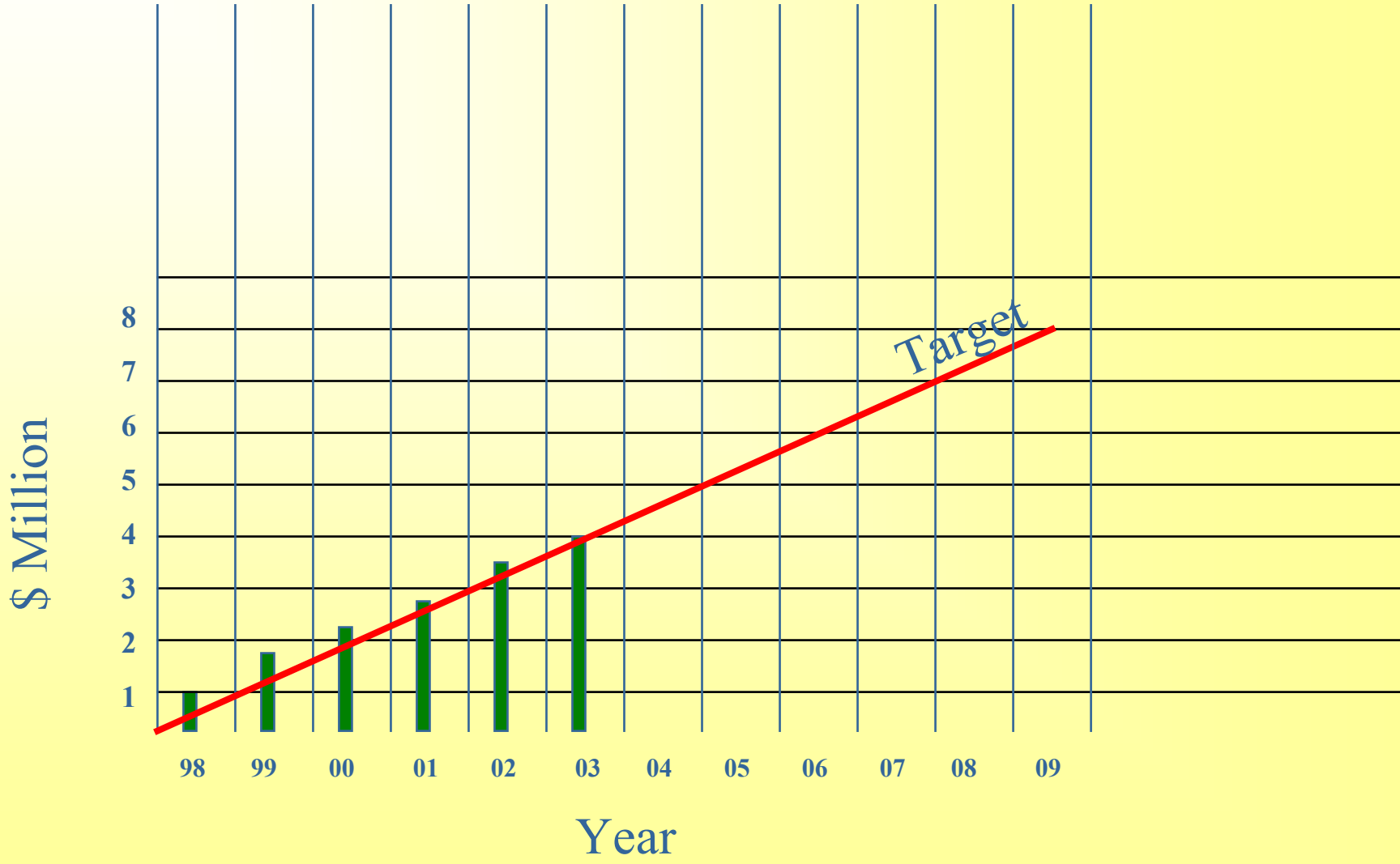
Automatic stand alone capability in the event of utility failure

Environmental friendly Facility

Space Available for future System Expansion

Existing Space Opened up for other uses after removal of old Equipment.

Cumulative Cash Flow




870
EMERGENCY

Facility Two:

A 134 bed Beloit Wisconsin Hospital

Requirement:

Emergency/Generator Replacement & Electrical/Mechanical Systems Upgrade

ELECTRICAL:

A) Emergency Generators Old & High Maintenance Risk

B) Transfer Switches Undersized

C) Main Service Upgrade from Medium Voltage to High Voltage

MECHANICAL:

A) Cooling Equipment Shortfall

B) Steam Headers Undersized Due to Increased Load

CAPITAL COST OF REPLACEMENTS & UPGRADES
$1,900,000

Recommended Solution

(A) Replace Old Under sized Diesel Generators with New 3MW Dual Fuel Generators & Configure as a C.H.P.

(B) Add Additional Chiller Capacity Through an Absorption Chiller & Utilize Heat from the New Generators to Fuel the Chiller.

(C) Increase Steam Header Between Boilers & Ground Floor Equipment Room.

(D) Replace 12,470 Volt Service and Upgrade Main Electrical Distribution. Provide Instant Separation from Utility Upon Local Utility Failure for 100% Total Facility Back-Up.

(E) Build a New Power Plant to house New Generators and Control room

(F) Sell Excess Power to Utility and utilize Heat Recovery for Hospital

Capital Cost for C.H.P. & Upgrades = $3,000,000

Dual Fuel Diesel Start
& 99% Natural Gas Run
10 second start

Total Stand-Alone
with 100%
Redundancy During
Utility Outage

Automatic
Electric & Thermal
Stand-By

Environmentally
Friendly Facility

Beloit Memorial Hospital C.H.P.

Beloit, Wisconsin

Two Gensets
@ 1,506 KW
900 RPM 480 Volt

Power Output
40% Used on Site
60% Exported to Grid
Total Heat Recovery
Benefit to Hospital

Automatic Standby for
Entire Facility

Heat
Recovered
is Used for

Building Heating

Domestic Hot Water

And Chilled Water
400 Ton Absorber

C.H.P. Logic

C.H.P. Peak Hour Electric Capacity = 11,000 MWH/Yr.

C.H.P. Cost Including Maintenance = $53.90 MW/Hr.

Hospital Peak Hours Electric Use = 4,100 MWH/Yr.

Utility Cost to Purchase = $78.40 MW/Hr.

Utility Buyback Remainder = 6,900 MWH/Yr.

Utility Buyback Rate = $55.30 MW/Hr.

C.H.P. Thermal Output = 3.75 MMBTU/MW/Hr.

Hospital Thermal Requirements = 14MMBTU/Hr.

Economic Savings

(A) Hospital Cost to Produce 1 MMBTU/Hr. = $6.57
Therefore the Value of C.H.P. Thermal
Production ($6.57 X 3.75 MMBTU/MW/Hr.) = $24.64 MW/Hr.

(B) True Cost Per MW/Hr.
(Fuel + Maintenance Cost = $53.90 - $24.64) = $29.26 MW/Hr.
Yearly Cost to Produce 4,100 MWH
(4,100 X $29.26) = $119,966

(C) Yearly Cost to Buy from Utility 4,100 MWH
(4,100 X $78.40 MW/Hr.) = $321,440

(D) Yearly Buyback Receipts from Utility
($55.30 - $29.26) MW/Hr. X 6.900 MWH = $179,676

YEARLY SAVINGS (C – B + D) = $381,150

C.H.P. Economic Advantage and Benefits

(A) $ 3 million cost Retirement within 10 years Based on C.H.P. savings and low interest loan from utility

(B) 100 % availability of the hospital electrical and thermal needs

(C) New automatic switchgear and high voltage network for normal and emergency power.

(D) New Chiller and System upgrade

(E) July 2. 2003 Severe weather knocked out power in northern Illinois and southern Wisconsin for up to 4 days. Beloit Memorial Hospital was the only Hospital that operated 100% through the use of its C.H.P. Facility.

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